Abstract of the Disclosure

A system and method which is capable of compensating for unintended elevations in process temperatures induced in a substrate during a semiconductor fabrication process in order to reduce or eliminate disparities in critical dimensions of device features. The system may be a plasma etching system comprising a process chamber containing an electrostatic chuck (ESC) for supporting a wafer substrate. A chiller outside the process chamber includes a main coolant chamber, which contains a main coolant fluid, as well as an compensation coolant chamber, which contains an compensation coolant fluid. A main circulation loop normally circulates the main coolant fluid from the main coolant chamber through the electrostatic chuck to maintain the chuck at a desired set point temperature.